

## **River Gravel Excavation Policy and Stream Management**

August 1998

Concerns about river gravel and flooding have been raised by many different groups that utilize rivers or live near a river. This paper helps provide a historical and political and technical perspective on this important issue.

The 1986 Rivers Act resulted only in the prohibition of commercial gravel mining activities in rivers and streams. Since that date, gravel excavation has continued to be routinely approved for the purpose of property protection wherever it is determined that removal will provide the intended relief and will not significantly contribute to increased system instability.

Through the late '70's and early '80's, the practice of gravel mining from rivers proliferated. The price of gravel had risen substantially and rural development trends increased substantially. This, in turn, exerted pressure on towns to improve and expand their rural road systems to accommodate the increased traffic demands.

By the mid '80's, mining was being intensively practiced by landowners, municipalities and private contractors on many streams including the Mad River in Waitsfield, Warren and Moretown, the West Branch in Stowe, the Huntington River in Huntington and Richmond, the Browns River in Underhill and Jericho, the Trout River in Montgomery, the Third Branch in Braintree, Randolph, Bethel, the White River in Hancock, Granville, Rochester, Stockbridge, Bethel, Royalton and Sharon and the North Branch of the Deerfield in Wilmington and Dover. Many other streams also experienced mining but to a lesser degree.

Typically, on these most intensively mined streams, virtually every gravel deposition (usually point bars, sometimes islands) would be excavated to low water level annually. It is estimated several hundreds of thousands of cubic yards were being removed each year. At up to two dollars a cubic yard in the river, for many landowners, this practice represented big money.

By 1985 and after a decade or more of extensive, primarily profit driven activity, the agency and other resource users observed and became concerned about the high degree of instability being exhibited by virtually all river systems in which mining was being practiced. Instability was manifested as streambed degradation, undermining of streambanks, bridge abutments and culvert headwalls, loss of bank vegetation and increased rates of bank erosion and lateral movement with consequent property damages.

Agency observations of stream channel response to mining coincided with the conclusions of studies done by others and results of geomorphological modeling.

Stream channel stability is a function of a number of physical parameters; one of the most important being the consistent transport of sediment through the system. All streams have a capacity to move sediment provided by the energy of water flowing downhill under the force of

gravity. Isolating this one parameter, it can be stated that a stream will remain stable as long as the volume of sediment entering a given reach of stream is in balance with the volume of sediment that is being transported through the reach. Otherwise, the stream bed will build up (aggrade) or scour down (degrade) and, in either case, result in increased rates of bank erosion and/or overbank flooding.

This explains why mining or dredging operations which remove a significant volume of the sediment available for transport throws the system out of balance. The river continues to move sediment out of the reach, but if an equal volume of sediment cannot replenish that which is scoured away because it has been mechanically removed from the system, increased bed degradation, bank erosion and instability will result.

The unfortunate part of this whole matter is that we, collectively, never really did anything substantive to help any of the stream reaches heavily damaged by mining recover from this ill-advised activity. In many cases, the condition of stability has not improved or has even gotten worse.

Under stress; i.e., mining, floods, land use induced watershed hydrologic change, human encroachments and constraints, loss of streambank vegetation; river systems may convert from stable to unstable forms. Vermont's rivers, particularly those damaged in the past by mining and more recently by flooding, increasingly exhibit the unstable form.

Typically, the unstable form persists for decades influencing significantly degraded property and resource values until such a time as the stable form is restored. In many cases, the unstable reach may never recover on its own.

75-80% of sediment in unstable alluvial river systems is typically generated from bank erosion along the unstable reach. The excessive sediment load creates a viscous cycle in which the stream sediment transport capacity is reduced as the channel gets wider and shallower and more erosion introduces more sediment into the system.

Neither bank armoring nor dredging alone will restore the stable form.

Exacerbating the socio-political aspects of this issues is that we are presently experiencing an unprecedented (at least in recorded history) frequency of disastrous flood events. The upward spiraling magnitude of human economic loss associated with flooding is primarily a function of extreme meteorological events, climatological cycling or change, the rising level of human investments and development within riparian corridors and the pervasive, unstable condition of the river systems.

Department staff will continue to provide an intensive level of public assistance in response to the flood and will apply the policy as described above. Where gravel removal or dredging will provide a meaningful level protection for private property or public infrastructure and removal will not significantly contribute to a higher level of system instability, such work will be approved. But please note, these projects usually accomplish nothing in the long term. They just leave the problem to rise, tsunami-like, another day.

The Stream Alteration Section staff is working to begin a major river restoration initiative. Partnerships with other state and federal agencies are being formed, funding is being sought and received.

Please note that river restoration, or restoration of the stable form, may, in many cases, include extensive dredging, channel relocation and realignment, structural treatments and revegetation; but in a designed, technically sound manner which maximizes the probability of long term stability.

A cornerstone of the department recommendations will be the facilitation of river restoration projects which we believe will provide immense public benefits through enhanced river system stability and property protection.